

# **Guam Environmental Protection Agency Beaches Environmental Assessment and Coastal Health (BEACH) Act**

## **2016 Program Summary of the Recreational Beach Monitoring Program**

### **RBMP Background**

The Recreational Beach Monitoring Program is managed by Guam EPA's Environmental Monitoring and Analytical Services Division. The Division takes water samples of 44 recreational beaches every week and analyzes the samples for concentrations of the enterococci bacteria. Enterococci bacteria are found in warm blooded animal fecal matter and if detected in a water sample, indicate the possible presence of other more harmful microorganisms. Advisories are based on approved standards using the enterococci



Sampling at E. Hagåtña Bay

indicator. If concentrations of the bacteria are above approved standards, the beach is deemed 'polluted' and an advisory against swimming and wading is issued. Swimming, fishing or playing in polluted waters may result in minor illnesses such as sore throats or diarrhea. It might also result in more serious illnesses such as meningitis, encephalitis, or severe gastroenteritis. Children, the elderly and people with weakened immune systems have a greater chance of getting sick when they come in contact with contaminated water. Since 1974, Guam EPA has performed this community service weekly.

During 2015, Guam EPA Board of Directors adopted the 2012 *Recreational Water Quality Criteria* (EPA 820-F-12-058). The Guam Legislature is expected to codify the new criteria upon discussions with current Guam EPA administration.

Guam EPA is in the process of updating its Recreational Beach Monitoring Program (RBMP) Plan, as required by the United States Environmental Protection Agency under the BEACH Act grant. New performance criteria listed in the 2014 *National Beach Guidance & Required Performance Criteria for Grants* (EPA-823-B-14-001) will be addressed. Guam EPA will use the guidance to update our RBMP Plan's approach in meeting the new performance criteria that will improve our efforts in identifying sources of fecal pollution, disseminating information to the public, and supporting site-specific solutions for protecting public health.

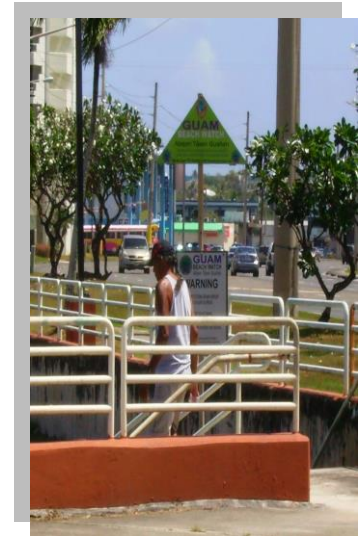
For this report, previous performance criteria (2002 National Beach Guidance) are in effect. As part of the RBMP plan, a risk based evaluation was conducted on all of Guam's one hundred twelve (112) identified beaches in 2003. Beaches were classified into tiers: Tier-one beaches are easily accessible, highly frequented beaches, with a high

number of possible pollution sources, which would require frequent monitoring. Tier-two beaches are less frequented beaches with restricted accessibility, have little pollution sources and require less frequent monitoring. Tier-three beaches are classified as very infrequently visited, remote and/or very inaccessible and not monitored routinely.

Thirty-nine (39) beaches were deemed inaccessible or not suitable for recreational use and the remaining seventy-three (73) were found to be accessible and suitable for recreational use. Further evaluation of the accessible beaches, resulted in thirty-nine (39) being classified as tier-one and the remaining thirty four (34) classified as tier-three. Currently, there are no beaches classified as Tier-two. Evaluation of these tier assignments are conducted annually.

### *RBMP Notification System*

Public notification is weekly via announcement over the internet (Guam EPA webpage, Twitter, Instagram, and email to media). In order to further expand our public notification system, Guam EPA completed the installation of swimming and wading advisory signs at the forty-two (42) tier-one beaches in January 2007. The advisory signs are written in English and Chamorro. The signs also have a system for attaching additional notification warnings, such as storm drain and beach closure signage when necessary. During 2014, signs were identified as needing refurbishment or replacement and the usage of all signs was discontinued. A Request for Proposal (RFP) to install new signs was created in 2014 and its processing is pending.



Closed “green” sign indicates bacteria levels are acceptable.



An open “yellow” sign for Advisory.

### *Bacteria Total Maximum Daily Loads (TMDL) of Guam’s Beaches*

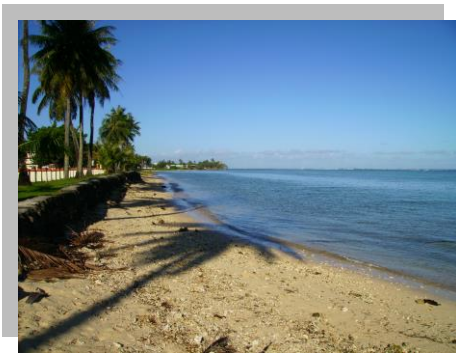
Guam beach TMDL project, **Guam Northern Watershed Bacteria TMDLs (December 2009)**, was approved in March 2010. The project targets reducing bacteria loading associated with runoff and non-point sources to seventeen (17) northern beaches. Reduction is possible through activities that include NPDES Permits, Section 401 Water Quality Certification, Individual Wastewater System Permits, Storm Water Management Plans, Underground Injection Controls (UIC), and efforts of partner agencies. In 2015, efforts were made to implement a bacteria TMDL project at one northern beach. A proposal is drafted and contract negotiations are underway. The project contract is anticipated to be finalized during the 2017 calendar year.

In 2012, Guam EPA again partnered with Region 9 USEPA to complete a second Bacteria TMDL for twenty five (25) beaches located in southern Guam. In addition to historic and recent data from Guam EPA’s beach watch program, physical and chemical water

quality data from Guam EPA's River and Coastal Status and Trends Monitoring Program (STMP) was incorporated into the development of the southern beaches TMDL. This data along with historic RBMP data provides a robust assessment of beach water quality. Analysis of all data points was completed in 2012. The draft document, **Development of Bacteria TMDLs for Twenty-five Guam Beaches (December 2013)**, identifies possible sources impacting Guam's beaches and targets those sources for reduction. This is the second of several TMDLs that are needed to address Guam's remaining list of "Impaired Waters".

### *Guam's Integrated Report (IR)*

Guam's IR is submitted every two years to USEPA and ultimately produces an "Impaired Waters" list. The next IR is due in 2018 and will encompass Guam beach data collected in 2016 and 2017. Beach categories in the IR are:



N-13 Hagåtña Bayside Park Beach. A TMDL site.

- C3 (insufficient available data and/or information to make a use determination),
- C4a (a TMDL to address a specific segment/pollutant combination has been approved or established) and
- C5 (available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed). In some cases, C5 beaches are placed on the 'Impaired Waters' list.

### **RBMP Sampling Sites**

Currently, the total number sampling sites at tier-one beaches is forty-four (44), as listed in attached [Table 1. Guam EPA RBMP Tier One Sites](#) and shown in [Figure 1. Guam EPA RBMP Sites](#).

### **2016 Recreational Beach Monitoring Program Summary**

Forty-four (44) sampling sites were monitored weekly for the USEPA approved enterococci indicator during the 2016 calendar year. This resulted in 2,242 samples analyzed ([Table 2. 2016 Guam EPA RBMP Sample Summary](#)). Swimming advisories are issued for M-2 class beaches based upon a single sample maximum concentration of 104 MPN/100mL or a geometric mean maximum concentration of 35 MPN/100mL, over five sequential samples. M-3 class beaches (applicable to two beaches from the current sites list N18 and N20) are subject to a single sample maximum concentration of 276 MPN/100mL or a geometric mean maximum concentration of 35 MPN/100mL, over five sequential samples.

Guam EPA issued five hundred sixty-two (562) swimming advisories and three (3) Preempt notifications (Apr-Jun 2016 – 1 notification based on squatters at N-04. Jul- Sept 2016 – One notification at all 44 sites based on rainfall >2". Oct-Dec 2016 – 1 based on

rough seas at N-10) against swimming and wading during the 2016 calendar year. No beaches were closed to swimming and wading during 2016 calendar year. (See attached [Tables 3a–3b. 2016 Guam EPA RBMP Advisory Summary](#)).

*Advisory Frequency:*

The frequency of advisory at each site during 2015 and 2016 is shown in [Figure 2a and 2b, 2015 and 2016 Frequency of Advisories at North and South Guam Beaches](#).

In 2016, like in 2015, S11 in Talofoto Bay recorded the highest advisory frequency (82%). Since 2012, this site presents yearly with advisory frequencies over 75%. **Sanitary survey investigations at Talofoto Bay may be conducted in 2017.**

S07 in Toguan Bay has the 2<sup>nd</sup> highest advisory frequency in 2016 (as in 2015) at 78%. Toguan Bay is the receiving water of the Toguan River. The Guam Waterworks Authority (GWA) manages a wastewater treatment plant (WWTP) near the river and reported two incidences of a ‘sewage by-pass’ in 2016 that caused the release of 5,113,440 gallons of sewage to the nearby Toguan River. The Pump station is about 10m from the river and about 85m from the S07 beach site. **The Agency can further investigate effluent conditions at the GWA WWTP during 2017.**

In 2016, as in 2015, Site N12 (Hagåtña Boat Basin) in West Hagåtña Bay recorded 71% advisory frequency (3<sup>rd</sup> highest). Quarterly data ([Figure 6a & 6b](#)) at this site shows that no samples were in exceedance during the 1<sup>st</sup> quarter, but most were during the 2<sup>nd</sup> and all 3<sup>rd</sup> and 4<sup>th</sup> quarter samples were in exceedance. Although swimming/wading is restricted at site N12, boating activity is frequent. **The Agency can review Port Authority of Guam’s BMPs and further investigate water quality conditions at the marina during 2017. Investigation can include identifying possible pollution sources to the marina storm water culverts.**

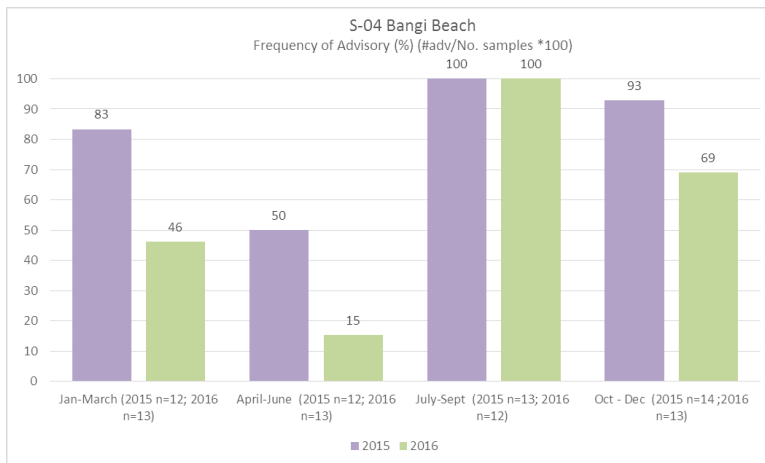
In 2014, Site S04 in Agat Bay presented with the highest frequency of advisories. At that time, 92% of samples collected and analyzed resulted in an advisory. Although there was a decrease in 2015 to 84% and then another decrease in 2016 to 57% advisory frequency, S04 has the 4<sup>th</sup> highest advisory frequency of all beaches monitored during 2016. Consistent violations at S4 initiated a sanitary survey investigation in October 2015. Representatives of Guam EPA participated in discussions with the Agat Mayor’s Office then gathered local watershed information and additional samples in order to identify and work towards mitigation of bacteria sources contributing to the beach. Two reports were prepared by the Monitoring Program regarding the water quality of the Finile River/Creek that empties to Bangi Beach RBMP S04 site. Project recommendations (Oct 8, 2015) are:



Tributary to Finile River and Agat Bay (site S-04). Channelized stretch of the tributary.



1. Background and current conditions of bacteria concentrations at Finile River indicate that a thorough sanitary survey of the area is meaningful.
2. Identification and reduction of bacteria sources is a priority and should include the identification of the following:
  - a. routes of storm water runoff to the river (NPS runoff entering into culverts/open channel),
  - b. the condition of sewer lines,
  - c. the effect of existing leaching field and septic tank systems to the river,
  - d. Wild animals, livestock and domesticated animals in the area.
3. Discussion with stakeholders on the water quality of the Finile River.
4. Identify condition of sewer lines and septic systems at the Tributary to Finile River,
5. Identify condition of sewer lines and septic systems at the mouth of Finile River (near F04) and culverts/stormwater drains nearby,
6. Identify 'sewage smell' source at F05.



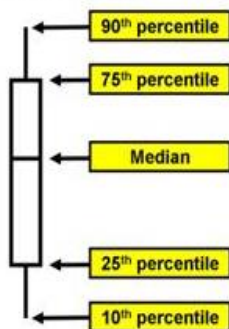
The figure at right, shows a decrease in advisory frequency during the dry season of 2016 as compared to 2015 (Jan-March and Apr-June) and also shows that all samples collected during the first part of the wet season in 2015 and 2016 (Jul-Sept) were in exceedance of criteria and then elevated in the 2<sup>nd</sup> part of the wet season.

Inspections at Finile River/Creek will be ongoing during 2017 and will involve continued consultation with the Agat Mayor's Office, GWA and the Department of Public Works. **Sanitary survey investigations at Agat Bay will continue in 2017.**

At several sites in Tumon Bay, East and West Hagåtña Bays, Asan Bay and Piti Bay, quarterly data ([Figure 6a and 6b](#)) also show increases in violations during the 3<sup>rd</sup> and 4<sup>th</sup> quarter. Bacteria associated with non-point source runoff are identified as contributing to high bacteria concentrations at these beaches (*Development of Guam Northern Watershed Bacteria TMDLs, December 16, 2009, Tetra Tech, Inc.*). Furthermore, bacteria concentrations in runoff can be high especially during a 'first flush' rainfall event. **Further investigation of non-point source runoff and watershed activities at Piti Bay and these other Bays can be conducted in 2017.**

[Figure 2a & 2b](#) also shows that bacteria advisories were not reported during 2016 at two sites, N04 Naton Beach, Guma Trankilidat in Tumon Bay and at N19 Family Beach in Apra Harbor (both a 2% decrease from 2015). In southern Guam, S12 Ipan Public Beach and S14 Tagachang Beach recorded a 2% and 4% advisory frequency respectively in 2016.

**"Box and Whisker" Format**



*Data Distribution:*

The 'box and whisker' format allows analysis of general patterns by displaying the distribution of the data. The graphical format for these plots is shown at right. The top of the 'whisker' is the 90th percentile, i.e. ninety percent of all data are at or below that level. The 'box' depicts the 75th percentile (top) and the 25th percentile (bottom). Half of all observed values fall within this range. The line through the 'box' is the median (or 50th percentile), while the bottom of the 'whisker' represents the 10th percentile." (Development of Guam Northern Watershed Bacteria TMDLs, December 16, 2009, Tetra Tech, Inc.)

[Figure 3a and 3b](#) show the spatial distribution of the 2016 Enterococci bacteria concentrations at each site in a box and whiskers plot. In these figures, 2016 data is applied to the box and whisker plot and the 2016 geometric mean at each site are shown as points. Also plotted as points with these is the geometric mean of 2015 data at each site.

[Figure 3a](#) shows the 75<sup>th</sup> percentile at the single sample maximum criteria at the following sites: N12 (Hagåtña Boat Basin) in W. Hagåtña Bay, N14 (Asan Bay Beach) in Asan Bay and N16 (Santos Memorial Park) in Piti Bay. In 2016, geometric mean exceedances also occur at these same sites. This list is identical to 2015. As noted above, the least average amount of enterococci bacteria found in 2016 at Guam's Northern Beaches is at the N04 Naton Beach - Guma Trankilidat and at N19 Family Beach.

[Figure 3a](#) also shows that bacteria concentrations at N11 Hagåtña Channel-Outrigger Ramp, N27 West Hagåtña Bay - Park and N28 West Storm Drain reach the maximum detection limit of the method.

[Figure 3b](#) shows the 50<sup>th</sup> percentile at the single sample maximum criteria at S11 Talofofo Bay. In 2016, geometric mean exceedances also occur at S-04 Bangi Beach, S-06 Umatac Bay, S-07 Toguan Bay, S-08 Merizo Pier at Mamaon Channel, S-10 Inarajan Bay and S-11 Talofofo Bay. Also as in 2013, 2014 and 2015, the least average amount of enterococci bacteria found in 2016 at Guam's Southern Beaches is at the S12 Ipan Public Beach and S14 Tagachang Beach Park.

*Bacteria TMDLs*

A review of up to eleven years of historic bacteria data, along with data analysis, source assessment and linkage analysis produced two bacteria TMDL documents, the *Guam Northern Watershed Bacteria TMDLs (USEPA R9 & Tetra Tech, December 2009)* and *Bacteria TMDLs for Twenty-five Guam Beaches (USEPA R9 & Tetra Tech, December 2013)*. These bacteria TMDLs characterize conditions at sites mentioned above:

- N11 Hagåtña Channel-Outrigger Ramp (W. Hagåtña Bay):

- TMDL development identifies that the 90th percentile exceeds the instantaneous maximum criterion in the moist zone. This indicates that sources associated with periodic short term problems (e.g., spills into the storm drain system or sewer overflows during rain events) may be a concern under these conditions.
- N12 Hagåtña Boat Basin (W. Hagåtña Bay):
  - Storm water and other sources appear to have approximately the same effect under (dry and wet) conditions at the Hagåtña Boat Basin. However, based on 2016 data only, [Figure 4a](#) shows that seasonal distributions vary during 2016.
  - Numerous sources appear to affect bacteria concentrations at this site and seasonal differences do not appear to be a factor. However, in 2016, seasonal differences appear to be affecting the site.
- N14 Asan Bay Beach (Asan Bay) and N15 Piti Bay:
  - The frequency of beach advisories is a significant public health issue and is also a concern for several northern beaches including Piti Bay where the beach advisory frequency reaches 90 percent.
  - While wet season results do tend to be higher, the seasonal analysis does not display any significant differences between the two seasons. This strongly suggests that bacteria sources are present throughout the year. [Figure 4a](#) shows different data distribution during the 2016 dry and wet season at Asan Bay and Piti Bay. Runoff pollution may have contributed to wet season concentrations during 2016.
  - Dry weather exceedances may be indicative of non-permitted point sources such as leaky sewers or failing septic tanks that are continuously discharging bacteria. The Agency can investigate whether wastewater systems in the area were repaired recently.
- N16 Santos Memorial Park (Piti Bay):
  - Although more exceedances are observed during the wet season, instantaneous dry season concentrations remain near the (single sample maximum criteria) WQS. The most critical months during the wet season are July through October. Furthermore, [Figure 4a](#) shows the 2016 data distribution during the dry and wet season at Piti Bay and Cabras Island that supports these findings.
  - Rainfall events during both wet and dry seasons as well as potential wastewater sources may be influencing the presence of bacteria.
- S04 Bangi Beach (Agat Bay):
  - A seasonal analysis of Bangi Beach data demonstrates significantly elevated bacteria concentrations throughout **both** seasons with the most exceptionally high concentrations occurring during the wet-season. [Figure 4b](#) shows the 2016 data distribution during the dry and wet season at Agat Bay and supports these findings. The significant number of dry-weather exceedances and elevated dry-season concentrations suggest that dry-weather sources, such as septic systems and leaky sewer mains, are influencing the water quality at Bangi Beach.
- S07 Toguan Bay:

- *The consistently high concentrations observed from July to December suggest the influence of wet season sources at Toguan Bay.*
- *Rainfall events during both wet and dry seasons influence the presence of bacteria at Toguan Bay and exceedances occur under all flow regimes. The exceedances under all flow regimes, particularly during dry weather and under low flow conditions, are indicative of potential point sources in the drainage area.*
- **S11 Talofofo Bay:**
  - *The annual analysis of water quality at Talofofo Bay reveals that enterococci concentrations at this site are significantly high and require critical attention. [Figure 4b](#) shows a shift toward higher concentrations in both dry and wet data distribution during 2016 at Talofofo Bay in comparison to other Southern beaches. This supports the findings of the TMDL.*
  - *The seasonal analysis reveals that elevated bacteria concentrations occur during the dry season and, to a greater extent, wet season.*
  - *The greatest exceedances occur under high, moist, and mid-range flow conditions. Nearly every sample observed during high flow conditions exceeds the instantaneous WQS.*
  - *Exceedances are evident under the high, moist, and mid-range flow conditions and during both dry and wet seasons.*
  - *Although not a specific source of bacteria, the limestone geology found along the eastern regions of Southern Guam can enhance the transport of bacteria. The facile dissolution of limestone may create fractures in the bedrock inducing greater infiltrative capacities and increasing surface water-groundwater interactions.*

#### *Fishing Activities:*

'Swimmable and wadeable waters' also apply to fishing activity from Guam's shorelines. Spin casting is a common fishing practice during the summer months on Guam's west



**Research fishing at Guam's West Coast.**

coast where fishermen are exposed to shoreline water. [Figure 5](#) shows 2015 and 2016 data distribution of enterococci bacteria at five (5) waterbodies on Guam's west coast during the summer months of April to July. Site data was combined based on waterbody location. The figure shows similar low concentrations at Tumon Bay and at East Hagåtña Bay. Geometric mean values decreased in West Hagåtña Bay, Asan Bay, and Piti Bay from 2015 to 2016. The best summer-time water quality (for bacteria) in 2016 appears to be at Tumon Bay and East Hagåtña Bay. The box and

whisker chart shows that all collected samples at East Hagåtña Bay during the summer months (for both 2015 and 2016) were within the recommended criteria (SS max) and no exceedances were observed.



## **2016 Public Notification and Data Submission**

Prior to the weekend, advisories are reported via email to local print, radio, and television media, to other local government agencies and to private individuals. An advisory list is also published to Guam EPA's webpage. Weekly beach Notification by way of advisory signs at our beaches has been suspended for all forty-four (44) monitored beaches. RBMP Beach Watch signs are in need of replacement.

Guam EPA Monitoring program inputs laboratory results and field data to Guam EPA's W.A.L.T.E.R.S. database. The database will also be used to prepare and submit monitoring and notification data directly to USEPA's data warehouses according to eBEACHES submission requirements. Guam EPA's 2016 beach monitoring data will be submitted to STORET database via the Water Quality Exchange (WQX) during the 2017 calendar year once the Agency database is complete. STORET is EPA's STOrage and RETrieval system for water quality data. Submittal to these databases may take place weekly upon data input to W.A.L.T.E.R.S. database.

In order to maintain a comprehensive database of beach monitoring data for Guam's 2018 Integrated Report (IR), communication may be continued with the Lieutenant Commander of the Naval Hospital's Navy Branch Medical Clinic to include their data collected at Navy's beaches. In 2008, Navy personnel made an effort to restructure their beach monitoring program to resemble Guam EPA's beach monitoring and laboratory activities. Communication with Andersen Air Force base beach monitoring personnel is forthcoming.

## Future Program Activities

Local and federal funds are to be used to continue funding BEACH Act related activities:

Activity	Target
1. <b>Continue</b> funding a biologist position to manage the RBMP.	FY 2017 - 2018
2. <b>Continue</b> resupply of the laboratory and the monitoring program for all consumable materials (supplies) and necessary equipment.	FY 2017 - 2018
3. <b>Not completed in FY 2016:</b> Update design of new Guam Beach Watch Signs for installation. <b>Not completed in FY 2016:</b> Develop criteria for an automatic rain event advisory for all tier-one beaches. Pending update of Guam Beach Plan using 2014 National Beach Guidance and Required Performance Criteria for Grants. <b>Not completed in FY 2016:</b> Conduct individual correlation tests between turbidity and enterococci concentrations at southern beaches.	FY 2017 - 2018
4. <b>Continue</b> to track trends and assess data at individual RBMP beaches similar to data assessment of the bacteria TMDLs. Confer with PIO to provide this information to Guam EPA webpage.	FY 2017 - 2018
5. <b>Continue</b> Public and Federal Notification and Data Submittal. Public notification is weekly and federal submittals may be weekly.	FY 2017 - 2018
6. <b>2016 Annual Assessment Recommendations:</b> <ul style="list-style-type: none"> <li>Sanitary survey investigations at Talofofo Bay.</li> <li>Further investigate effluent conditions at the GWA WWTP during 2017 at S07 Toguan Bay.</li> <li>Identify bacteria sources at N12 Hagåtña Boat Basin (West Hagåtña Bay). The Agency can review PAG's BMPs and further investigate water quality conditions at the marina. Investigation can include identifying possible pollution sources to marina storm water culverts.</li> <li>Continue sanitary survey investigations at S04 Bangi Beach.</li> <li>Further investigation of non-point source runoff and watershed activities in Asan Bay, Piti Bay, Hagåtña Bays (East and West), Tumon Bay.</li> </ul>	FY 2017 - 2018
7. <b>Continue</b> support of the 2018 Guam Integrated Report. Incorporate process to include military beaches in update of Guam Beach Plan using 2014 National Beach Guidance and Required Performance Criteria for Grants.	FY 2017 - 2018
8. <b>Continue</b> to develop an annual Beaches Report.	FY 2017 - 2018
9. <b>Continue</b> evaluation of tier assignments annually based on the <i>2014 NATIONAL BEACH GUIDANCE AND REQUIRED PERFORMANCE CRITERIA FOR GRANTS</i> (USEPA). Assess current tier classification for necessary changes.	FY 2017 - 2018
10. <b>Continue</b> to support reduction activities and programs according to the Guam Northern Watershed Bacteria TMDLs (December 16, 2009) and the Draft Development of Bacteria TMDLs for Twenty-five Guam Beaches (December 2012). Consult with the Water Division of Guam EPA to identify efforts to support TMDL targets. Project is ongoing at forty-two (42) beaches.	FY 2017 - 2018
11. <b>Continue</b> development of a Bacteria Reduction Project started in 2015.	FY 2017 - 2018

**Table 1. Tier 1 Sites in the Guam EPA RBMP**

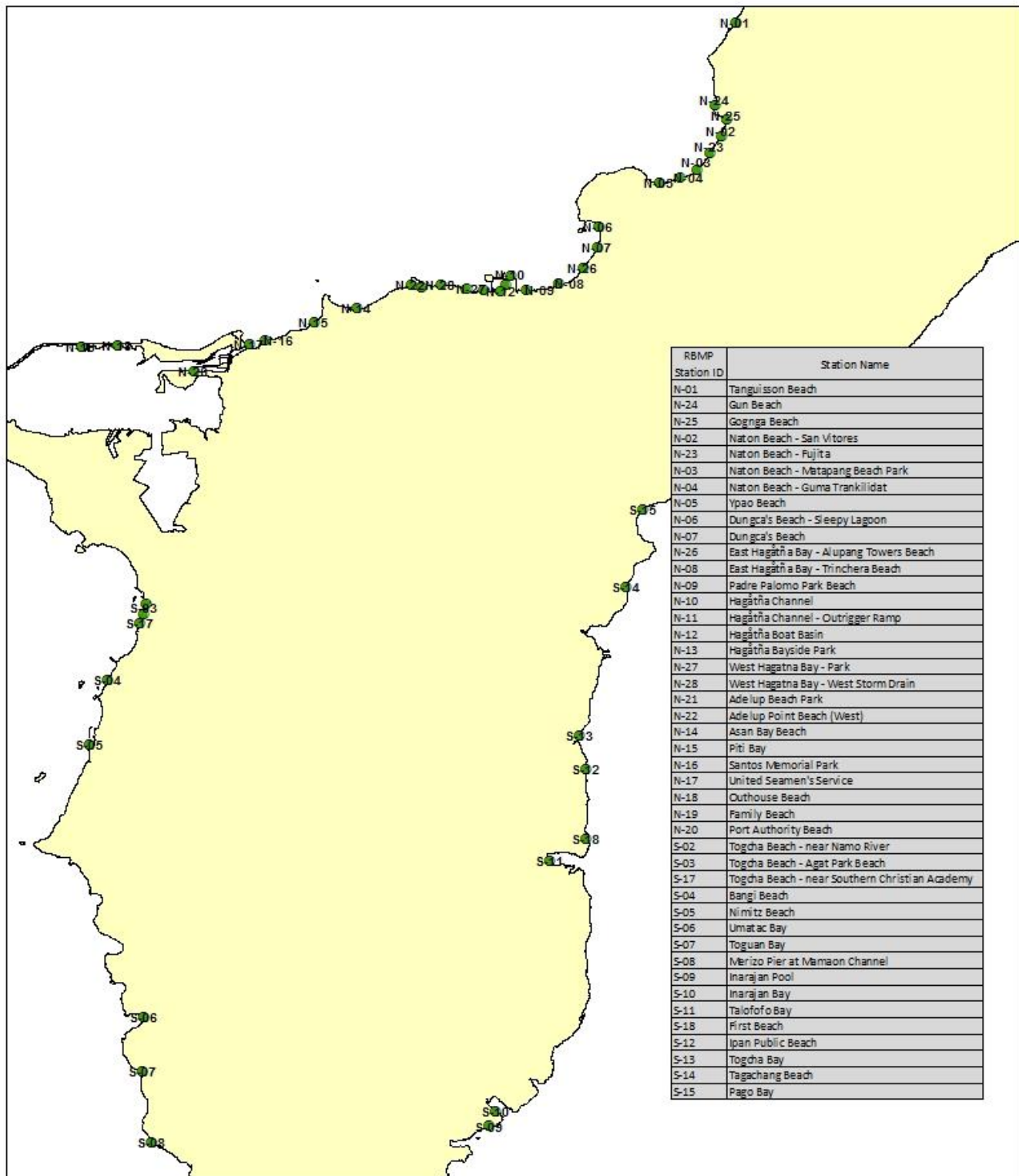
<b>Table 1a. Tier 1 Sites (North)</b>	<b>Waterbody name</b>
N01Tanguisson Beach	Tanguisson Beach Area (M-2)
N24Gun Beach	Tumon Bay
N25Gongga Beach	Tumon Bay
N02Naton Beach - San Vitores	Tumon Bay
N23Naton Beach - Fujita	Tumon Bay
N03Naton Beach - Matapang Beach Park	Tumon Bay
N04Naton Beach - Guma Trankilidat	Tumon Bay
N05Ypao Beach	Tumon Bay
N06Dungca's Beach - Sleepy Lagoon	East Hagåtña Bay
N07Dungca's Beach	East Hagåtña Bay
N26East Hagåtña Bay - Alupang Towers Beach	East Hagåtña Bay
N08East Hagåtña Bay - Trinchera Beach	East Hagåtña Bay
N09Padre Palomo Park Beach	East Hagåtña Bay
N10Hagåtña Channel	West Hagåtña Bay
N11Hagåtña Channel - Outrigger Ramp	West Hagåtña Bay
N12Hagåtña Boat Basin	West Hagåtña Bay
N13Hagåtña Bayside Park	West Hagåtña Bay
N27West Hagåtña Bay Park	West Hagåtña Bay
N28 West Hagåtña Bay	West Hagåtña Bay
N21Adelup Beach Park	West Hagåtña Bay
N22Adelup Point Beach (West)	Asan Bay
N14Asan Bay Beach	Asan Bay
N15Piti Bay	Piti Bay
N16Santos Memorial Park	Piti Bay
N17United Seamen's Service	Piti Bay
N18Outhouse Beach	Apra Harbor (M-3)
N19Family Beach	Apra Harbor (M-2)
N20Port Authority Beach	Piti Channel and Cabras Island

<b>Table 1b. Tier 1 Sites (South)</b>	<b>Waterbody name</b>
S02Togcha Beach - near Namor River	Agat Bay
S03Togcha Beach - Agat Park Beach	Agat Bay
S17Togcha Beach - near Southern Christian Academy	Agat Bay
S04Bangi Beach	Agat Bay
S05Nimitz Beach	Taleyfac Bay (M-2)
S06Umatac Bay	Umatac Bay (M-2)
S07Toguan Bay	Toguan Bay
S08Merizo Pier at Mamaon Channel	Cocos Lagoon (M-2)
S09Inarajan Pool	Agfayan Bay
S10Inarajan Bay	Inarajan Bay
S11Talofofo Bay	Talofofo Bay
S18First Beach	Talofofo Beaches
S12Ipan Public Beach	Talofofo Beaches
S13Togcha Bay	Togcha Bay
S14Tagachang Beach	Tagachan Beach Park Area
S15Pago Bay	Pago Bay

Figure 1. Guam EPA RBMP Sites



Guam EPA  
2016 RBMP Sampling Locations



GEPA MP 2017. For planning purposes only.

0 0.5 1 2 3 Miles





**Table 2. 2016 RBMP Sample Summary**

Field ID	Site Location	Sample # Jan-Mar 2016	Sample # Apr-Jun 2016	Sample # Jul-Sept 2016*	Sample # Oct-Dec 2016	TOTAL 2016
N01	Tanguisson Beach	13	13	12	13	51
N02	Naton Beach - San Vitores	13	13	12	13	51
N03	Naton Beach - Matapang Beach Park	13	13	12	13	51
N04	Naton Beach - Guma Trankilidat	13	13	12	13	51
N05	Ypao Beach	13	13	12	13	51
N06	Dungca's Beach - Sleepy Lagoon	13	13	12	13	51
N07	Dungca's Beach	13	12*	12	13	50
N08	East Hagåtña Bay - Trinchera Beach	13	13	12	13	51
N09	Padre Palomo Park Beach	13	13	12	13	51
N10	Hagåtña Channel	13	13	12	13	51
N11	Hagåtña Channel - Outrigger Ramp	13	13	12	13	51
N12	Hagåtña Boat Basin	13	13	12	13	51
N13	Hagåtña Bayside Park	13	13	12	13	51
N14	Asan Bay Beach	13	13	12	12*	50
N15	Piti Bay	13	13	12	13	51
N16	Santos Memorial Park	13	13	12	13	51
N17	United Seamen's Service	13	13	12	13	51
N18	Outhouse Beach	13	13	12	13	51
N19	Family Beach	13	13	12	13	51
N20	Port Authority Beach	13	13	12	13	51
N21	Adelup Beach Park	13	13	12	13	51
N22	Adelup Point Beach (West)	13	13	12	13	51
N23	Naton Beach - Fujita	13	13	12	13	51
N24	Gun Beach	13	13	12	13	51
N25	Gognga Beach	13	13	12	13	51
N26	East Hagåtña Bay - Alupang Towers Beach	13	13	12	13	51
N27	West Hagatna Bay - Park	13	13	12	13	51
N28	West Hagatna Bay - West Storm Drain	13	13	12	13	51
S02	Togcha Beach - near Namu River	13	13	12	13	51
S03	Togcha Beach - Agat Park Beach	13	13	12	13	51
S04	Bangi Beach	13	13	12	13	51
S05	Nimitz Beach	13	13	12	13	51
S06	Umatac Bay	13	13	12	13	51
S07	Toguan Bay	13	13	12	13	51
S08	Merizo Pier at Mamaon Channel	13	13	12	13	51
S09	Inarajan Pool	13	13	12	13	51
S10	Inarajan Bay	13	13	12	13	51
S11	Talofofo Bay	13	13	12	13	51
S12	Ipan Public Beach	13	13	12	13	51
S13	Togcha Bay	13	13	12	13	51
S14	Tagachang Beach	13	13	12	13	51
S15	Pago Bay	13	13	12	13	51
S17	Togcha Beach - near Southern Christian Academy	13	13	12	13	51
S18	First Beach (aka Ipan Point Beach)	13	13	12	13	51
<b>TOTAL</b>		<b>572</b>	<b>571</b>	<b>528</b>	<b>571</b>	<b>2242</b>

\*Preempt notifications released during the quarter (Apr-Jun 2016 – 1 based on squatters at the site. Jul- Sept 2016 - All sites based on rainfall >2". Oct-Dec 2016 – 1 based on rough seas at the site).

**Table 3a. 2016 Guam RBMP Advisory Summary**

Field ID	Site Location	Number of Advisories Jan- Mar 2016	Number of Advisories Apr-Jun 2016	Number of Advisories Jul- Sept 2016*	Number of Advisories Oct-Dec 2016	Total Number of Advisories 2016
N01	Tanguisson Beach	0	0	1	0	1
N02	Naton Beach - San Vitores	1	0	0	0	1
N03	Naton Beach - Matapang Beach Park	0	0	1	5	6
N04	Naton Beach - Guma Trankilidat	0	0*	1	2	3
N05	Ypao Beach	0	0	0	1	1
N06	Dungca's Beach - Sleepy Lagoon	0	1	0	0	1
N07	Dungca's Beach	0	0	0	0	0
N08	East Hagåtña Bay - Trinchera Beach	1	0	0	0	1
N09	Padre Palomo Park Beach	0	0	1	1	2
N10	Hagåtña Channel	0	0	2	1	3
N11	Hagåtña Channel - Outrigger Ramp	0	0	3	0	3
N12	Hagåtña Boat Basin	1	0	5	5	11
N13	Hagåtña Bayside Park	0	0	6	9	15
N14	Asan Bay Beach	0	0	9	0*	9
N15	Piti Bay	5	6	9	6	26
N16	Santos Memorial Park	0	11	12	13	36
N17	United Seamen's Service	0	2	8	10	20
N18	Outhouse Beach	0	0	8	13	21
N19	Family Beach	1	1	7	13	22
N20	Port Authority Beach	0	1	0	10	11
N21	Adelup Beach Park	0	0	5	6	11
N22	Adelup Point Beach (West)	1	2	7	10	20
N23	Naton Beach - Fujita	0	0	7	9	16
N24	Gun Beach	0	0	7	1	8
N25	Gongga Beach	0	0	0	4	4
N26	East Hagåtña Bay - Alupang Towers Beach	0	0	1	0	1
N27	West Hagatna Bay - Park	0	0	0	0	0
N28	West Hagatna Bay - West Storm Drain	0	0	2	1	3
S02	Togcha Beach - near Namu River	4	1	5	4	14
S03	Togcha Beach - Agat Park Beach	6	4	12	3	25
S04	Bangi Beach	5	6	12	2	25
S05	Nimitz Beach	6	2	12	9	29
S06	Umatac Bay	0	3	10	4	17
S07	Toguan Bay	0	6	12	7	25
S08	Merizo Pier at Mamaon Channel	10	9	10	11	40
S09	Inarajan Pool	1	10	12	3	26
S10	Inarajan Bay	1	0	4	3	8
S11	Talofofo Bay	1	1	7	8	17
S12	Ipan Public Beach	8	9	12	13	42
S13	Togcha Bay	0	0	5	1	6
S14	Tagachang Beach	0	1	0	0	1
S15	Pago Bay	0	0	5	5	10
S17	Togcha Beach - near Southern Christian Academy	0	2	0	0	2
S18	First Beach	1	0	7	11	19
TOTAL		53	78	227	204	562

\*Preempt notifications released during the quarter (Apr-Jun 2016 – 1 based on squatters at the site. Jul- Sept 2016 - All 44 sites based on rainfall >2". Oct-Dec 2016 – 1 based on rough seas at the site).

**Table 3b. 2016 Guam EPA/Guam Dept. of Public Health Closure Summary**

Beach Area	Number of Closures Jan- Mar 2016	Number of Closures Apr- Jun 2016	Number of Closures Jul- Sept 2016	Number of Closures Oct- Dec 2016	Total Number of Closures 2016	Total Number of Days on Closure 2016
(none)	0	0	0	0	0	0

Figure 2a and 2b. 2015 & 2016 Frequency of Advisories at North and South Guam Beaches

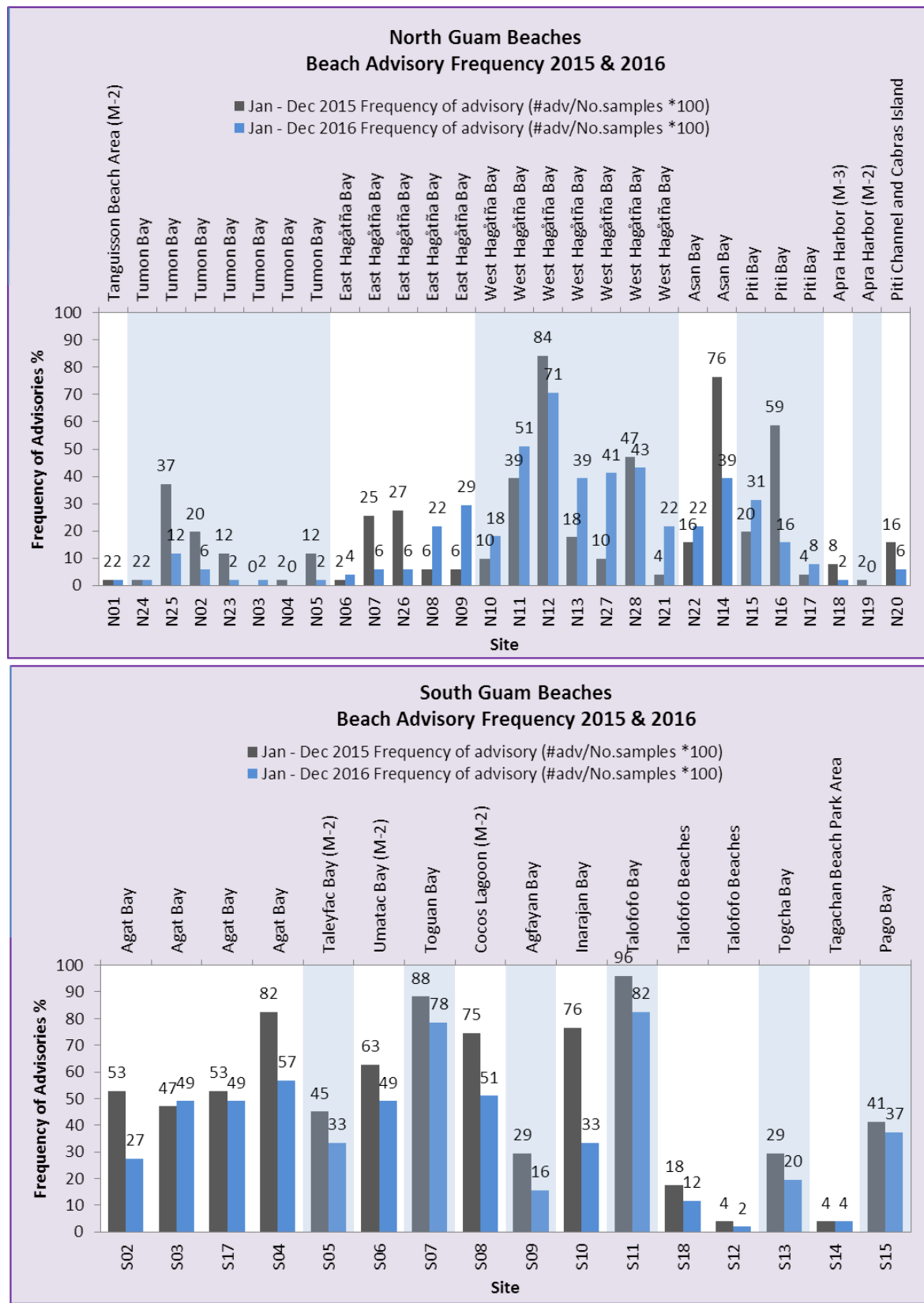
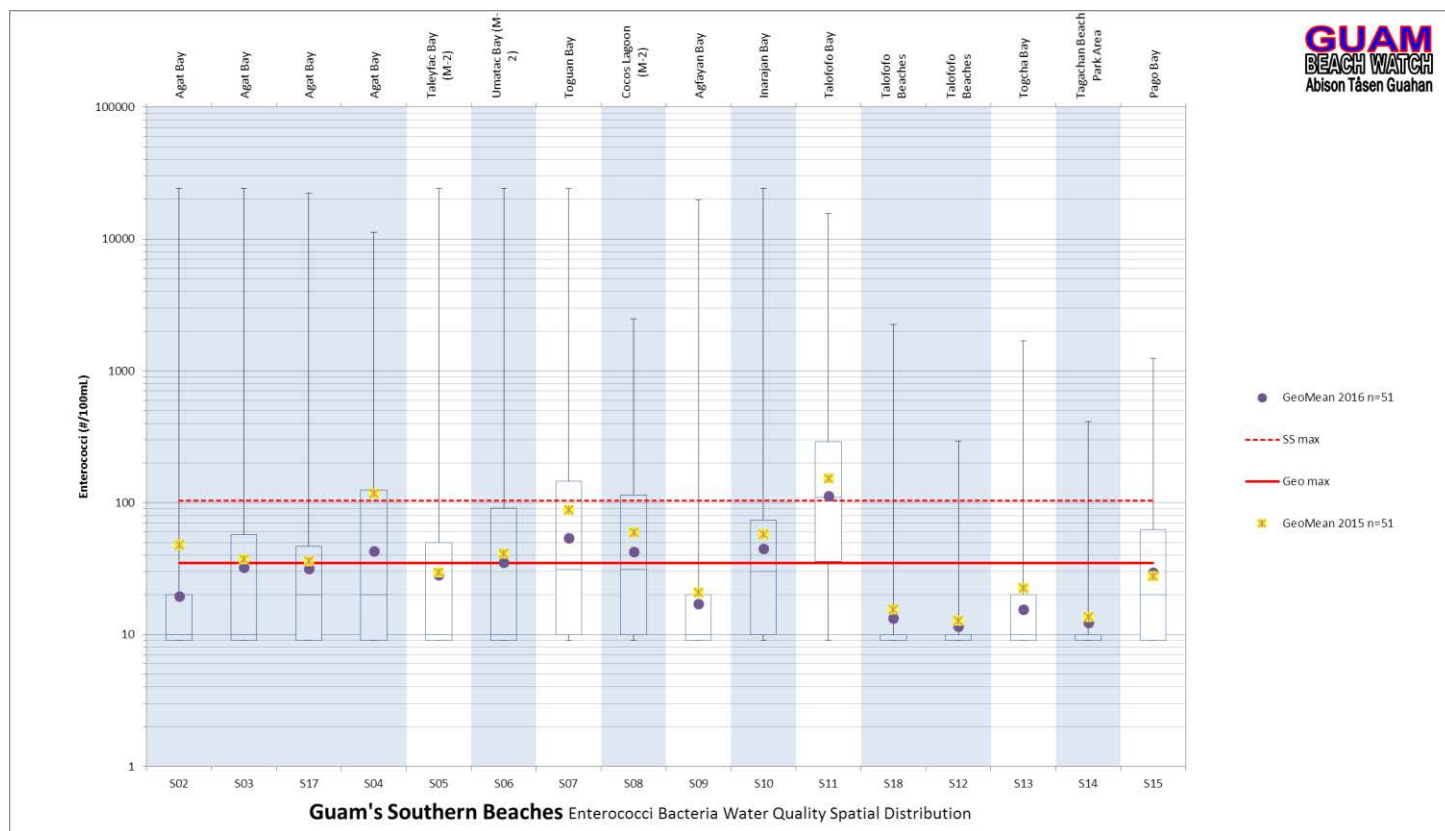
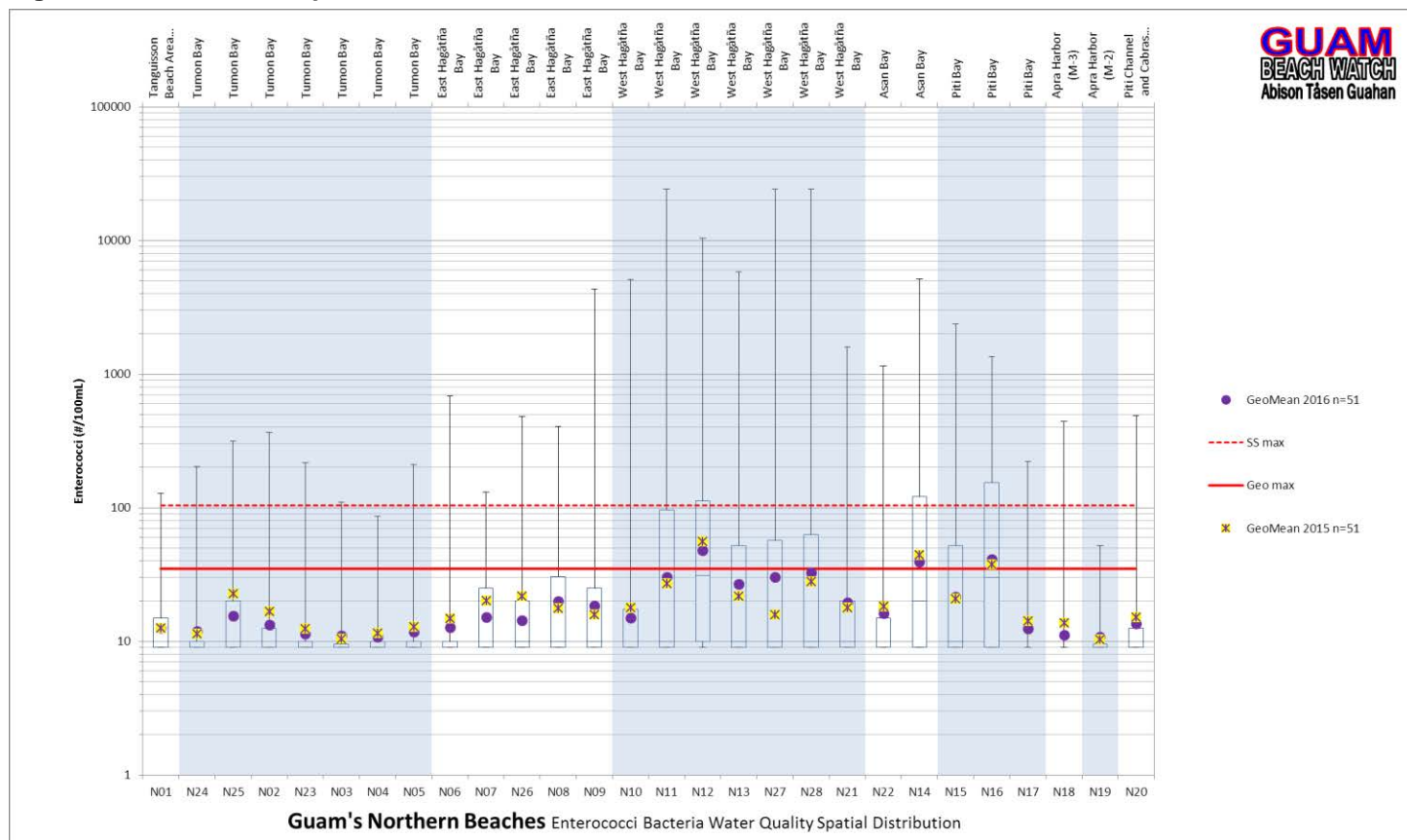
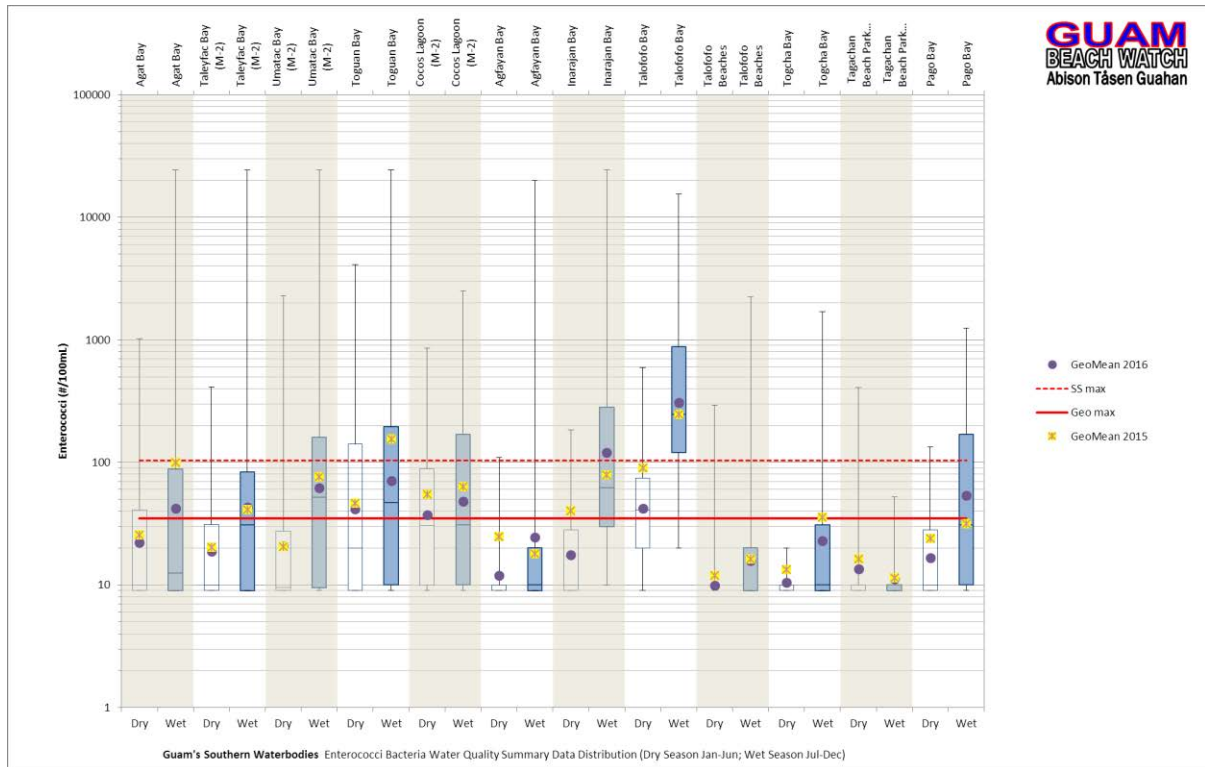
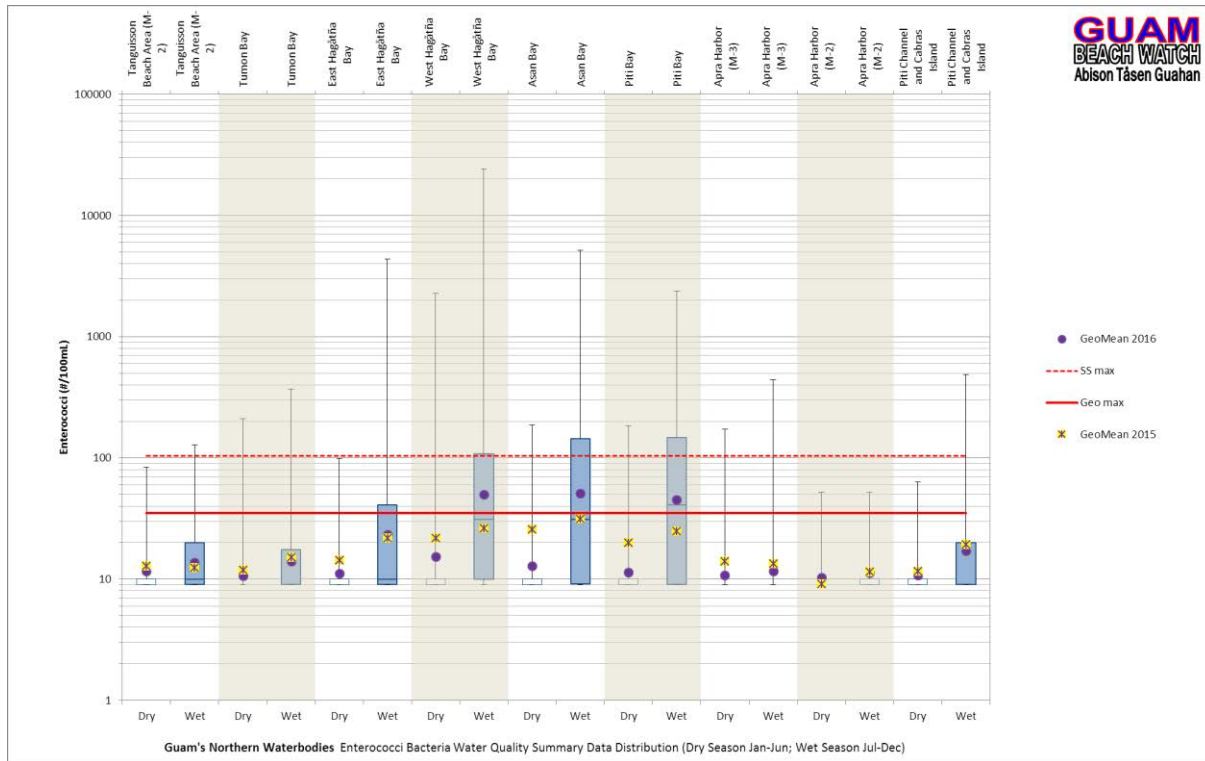




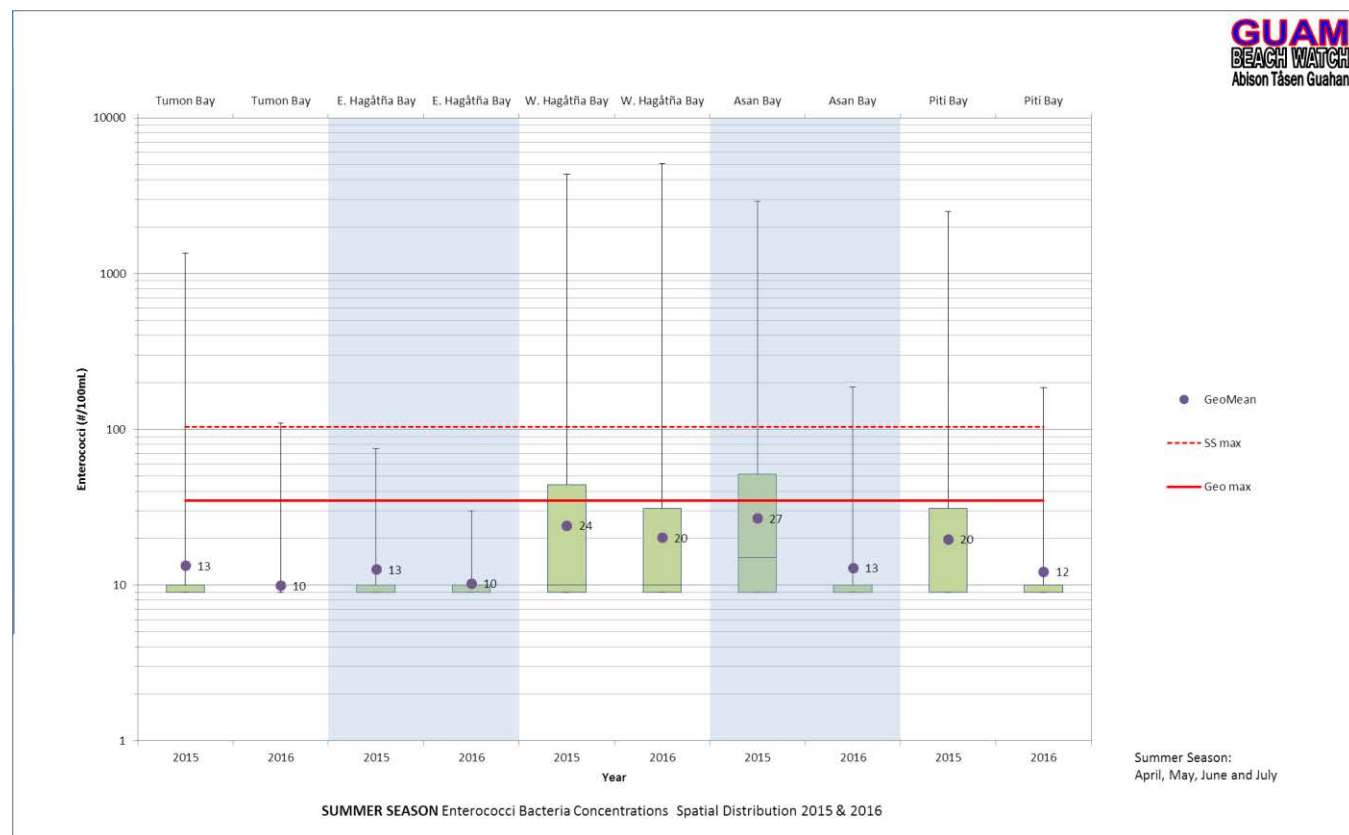
Figure 3a and 3b. 2016 Spatial Distribution with 2015 Geometric Mean



**Figure 4a and 4b. 2016 Spatial Distribution of Dry and Wet Season Enterococci Concentrations**



**Figure 5. 2015 & 2016 Spatial Distribution of Guam West Coast Waterbodies Summer Enterococci Concentrations**



**Figure 6a and 6b. 2016 Quarterly Frequency of Advisories at North and South Guam Beaches**

